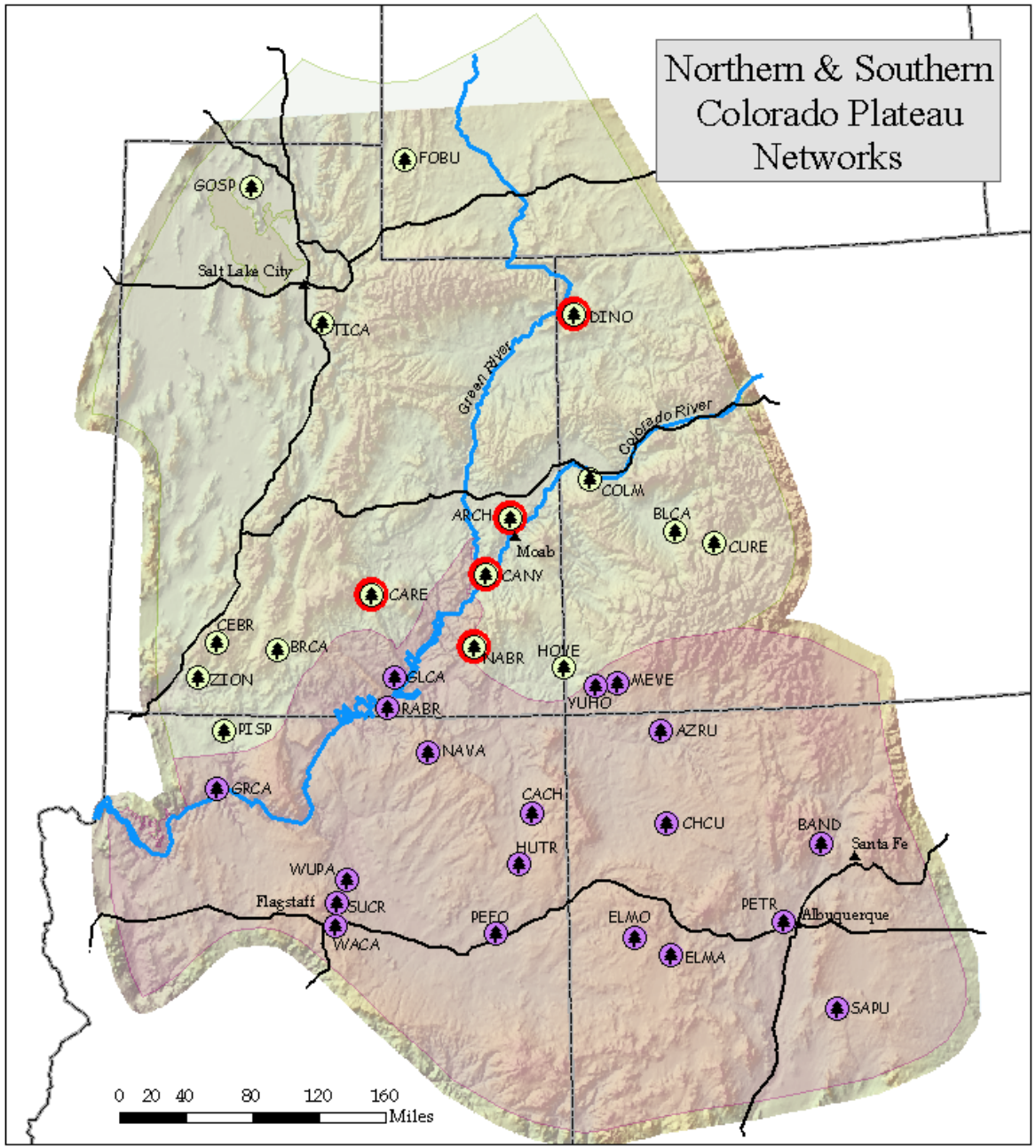
Northern Colorado Plateau Network

National Park Service photo

NORTHERN COLORADO PLATEAU NETWORK & PROTOTYPE

ARCH	**Arches National Park***
BLCA	**Black Canyon of the Gunnison Nat. Park**
BRCA	**Bryce Canyon National Park**
CANY	**Canyonlands National Park**
CARE	**Capitol Reef National Park**
CEBR	**Cedar Breaks National Monument**
COLM	**Colorado National Monument**
CURE	**Curecanti National Recreation Area**
DINO	**Dinosaur National Monument**
FOBU	**Fossil Butte National Monument**
GOSP	**Golden Spike National Historic Site**
HOVE	**Hovenweep National Monument**
NABR	**Natural Bridges National Monument**
PISP	**Pipe Springs National Monument**
TICA	**Timpanogos Cave National Monument**
ZION	**Zion National Monument**

*Highlight denotes Prototype Park



Northern Colorado Plateau Network

16 Parks

1,166,273 Acres

4 States

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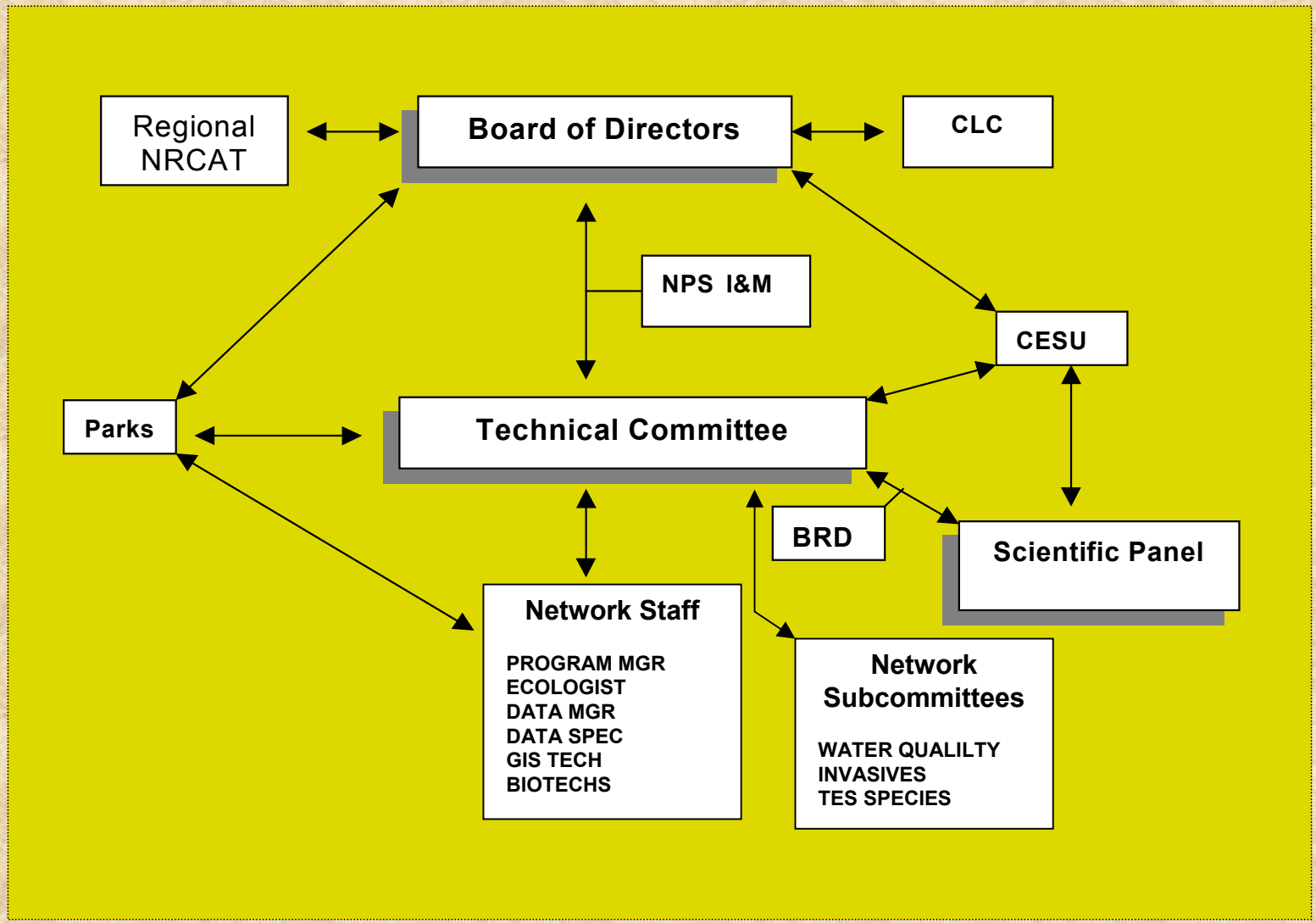
Northern Colorado Plateau Prototype

5 Parks

Organizational Structure for the Northern Colorado Plateau Inventory & Monitoring Program

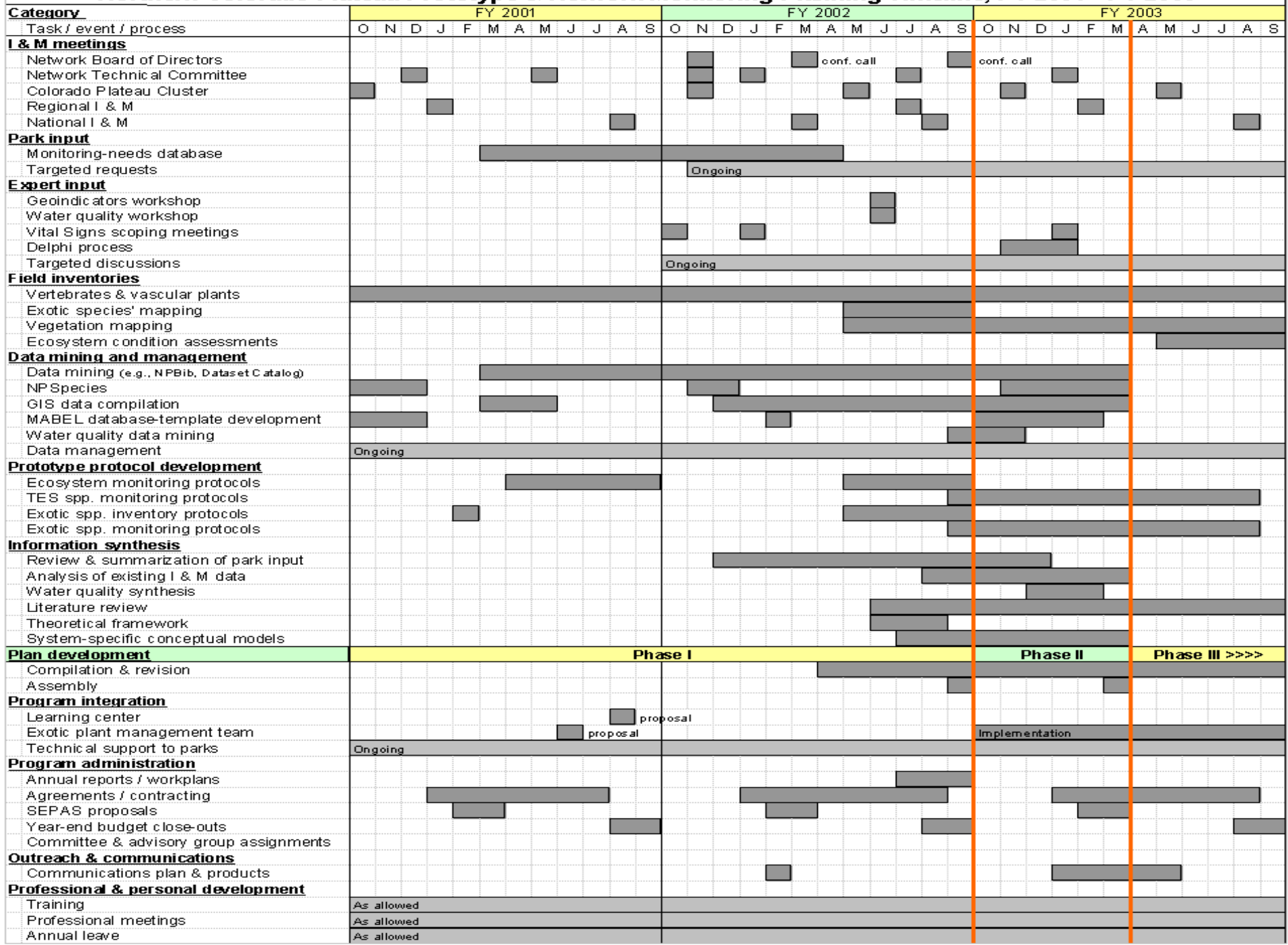


I & M STAFF

NORTHERN COLORADO PLATEAU NETWORK & PROTOTYPE

- Dr.Angie Evenden, Program Manager
  Dr. Mark Miller, Program Ecologist
  Margaret Beer, Data Manager
  Libby Nance, Data Management Specialist
  Aneth Wight, GIS Technician
  Sonya Daw, Mary Moran, Mike Estenson Biotechs
  Rich Alward, Beth Newingham, USGS Scientists

Northern Colorado Plateau Prototype & Network Monitoring-Planning Timeline, FY 2001 - FY 2003



Program Components: Prototype & Network

- I & M Meetings
- Park input
- Expert input
- Field inventories
- Data mining and management
- Prototype protocol development
- Information synthesis

- *PLAN DEVELOPMENT*

- Program integration
- Program administration
- Outreach & communication
- Professional & personal development

PROTOTYPE MONITORING THEMES

- Ecosystem Structure and Function

- Invasive Plants

- Threatened & Endangered and Sensitive Species

NETWORK MONITORING THEME

- **Water Quality Monitoring**

  Same Timeline as Vital Signs

  Data Mining and Synthesis

  Database Development &
  Data Analysis

GOOD EXPERIENCES

Excellent Support from WRD

POOR EXPERIENCES

Poor Choice of Cooperator

Distance from Network

NCPN Vegetation Mapping Project

Bureau of Reclamation
Remote Sensing and Geographic Information Group

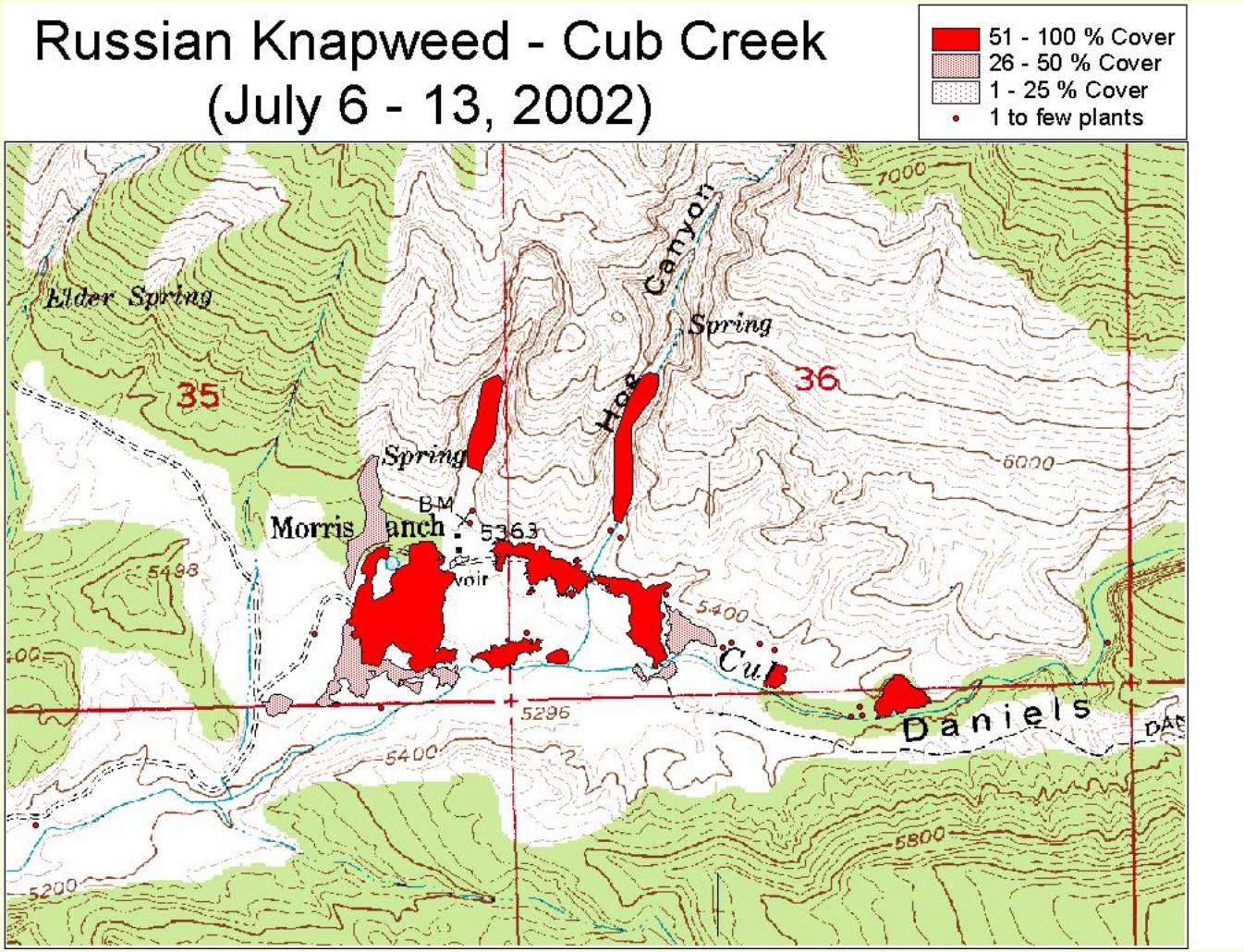
15 Parks

5 year project
$6M
Initated 2001

Leveraged Funds:
NPS/USGS VegMap
Firepro
Fee Demo
Park Base
Network I&M
Prototype

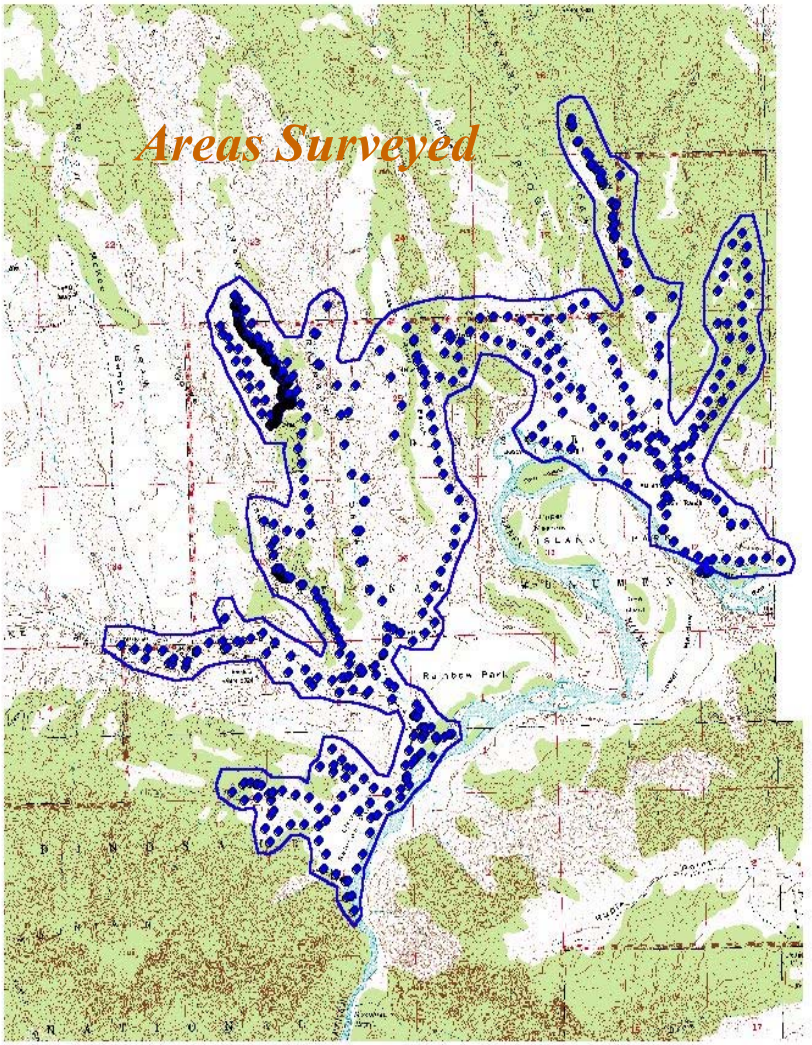
Partners:
USGS
BOR
NatureServe

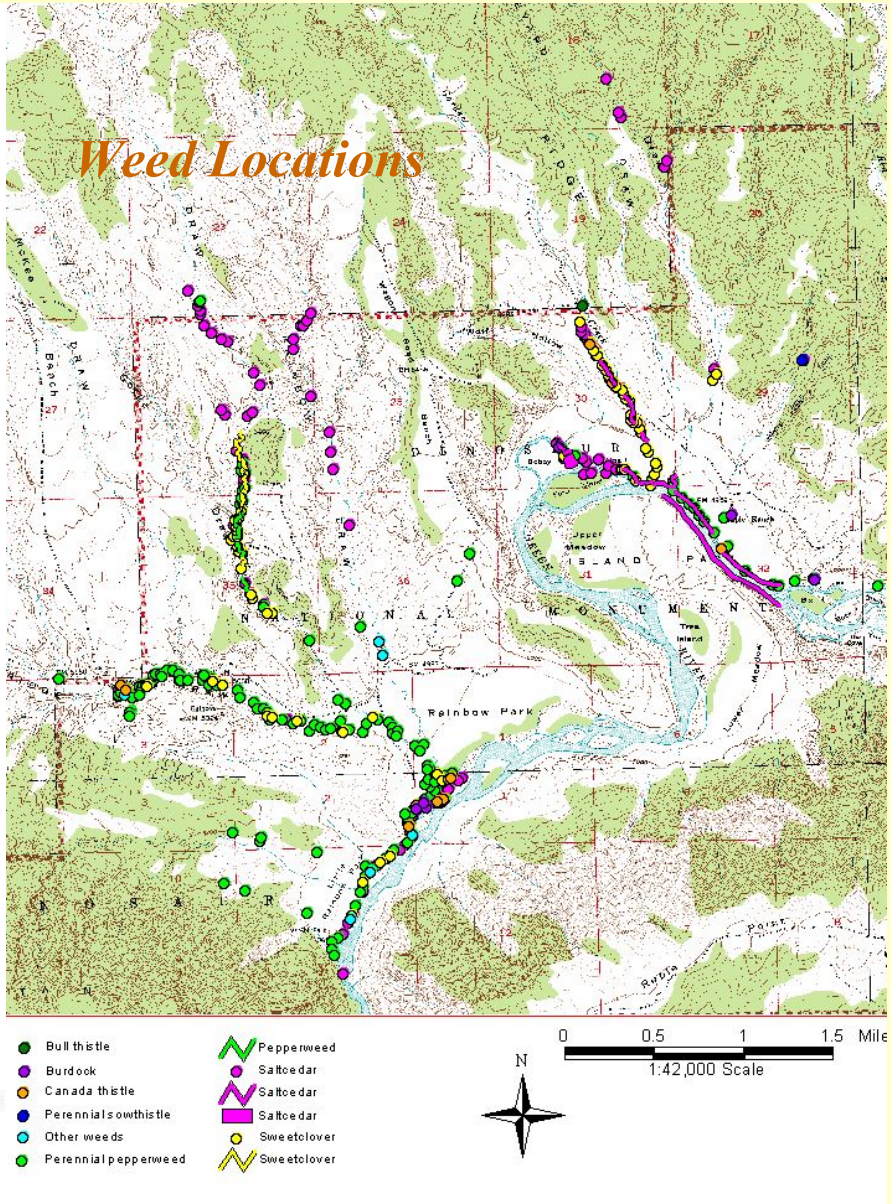
NCPN Invasive Plant Inventory Protocol Development



Cooperative Project with Utah State University

NCPN Invasive Plant Inventory Protocol Development



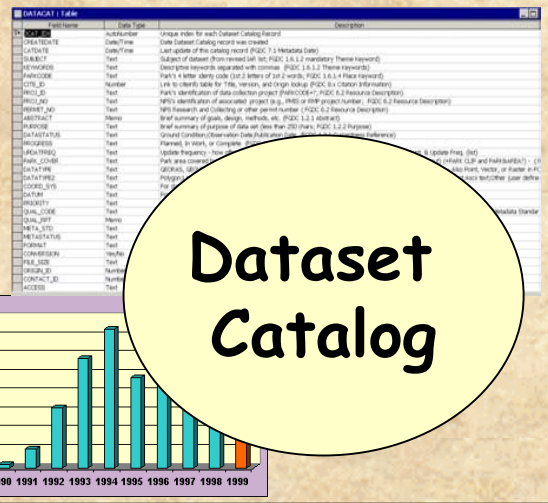


Cooperative Project with Utah State University

SUMMARIZE EXISTING DATA & UNDERSTANDING

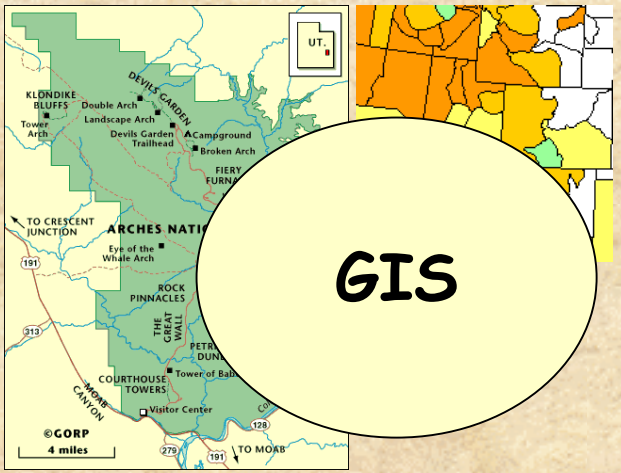


NPSpecies



Dataset Catalog


NPBib



GIS

SUMMARIZE EXISTING DATA & UNDERSTANDING

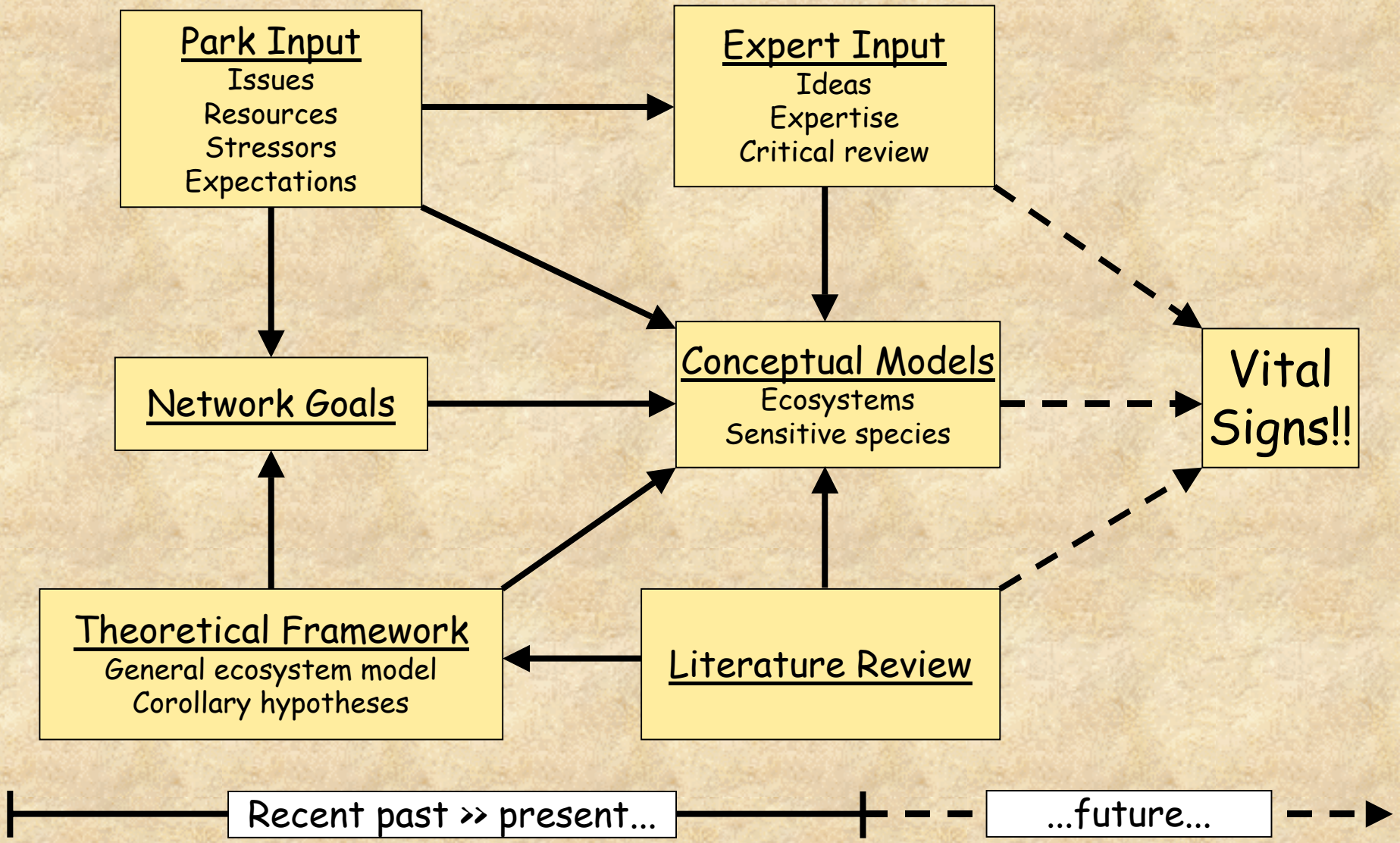
- Park Input
  - Resource/Stressor Database
  - Questionnaires and Interviews
  - Targeted Requests
  - Technical and BOD Meetings

- Expert Input
  - VS Scoping Meeting - January 2002
  - Geoindicators Scoping - June 2002
  - Water Quality Scoping - June 2002
  - Targeted Requests

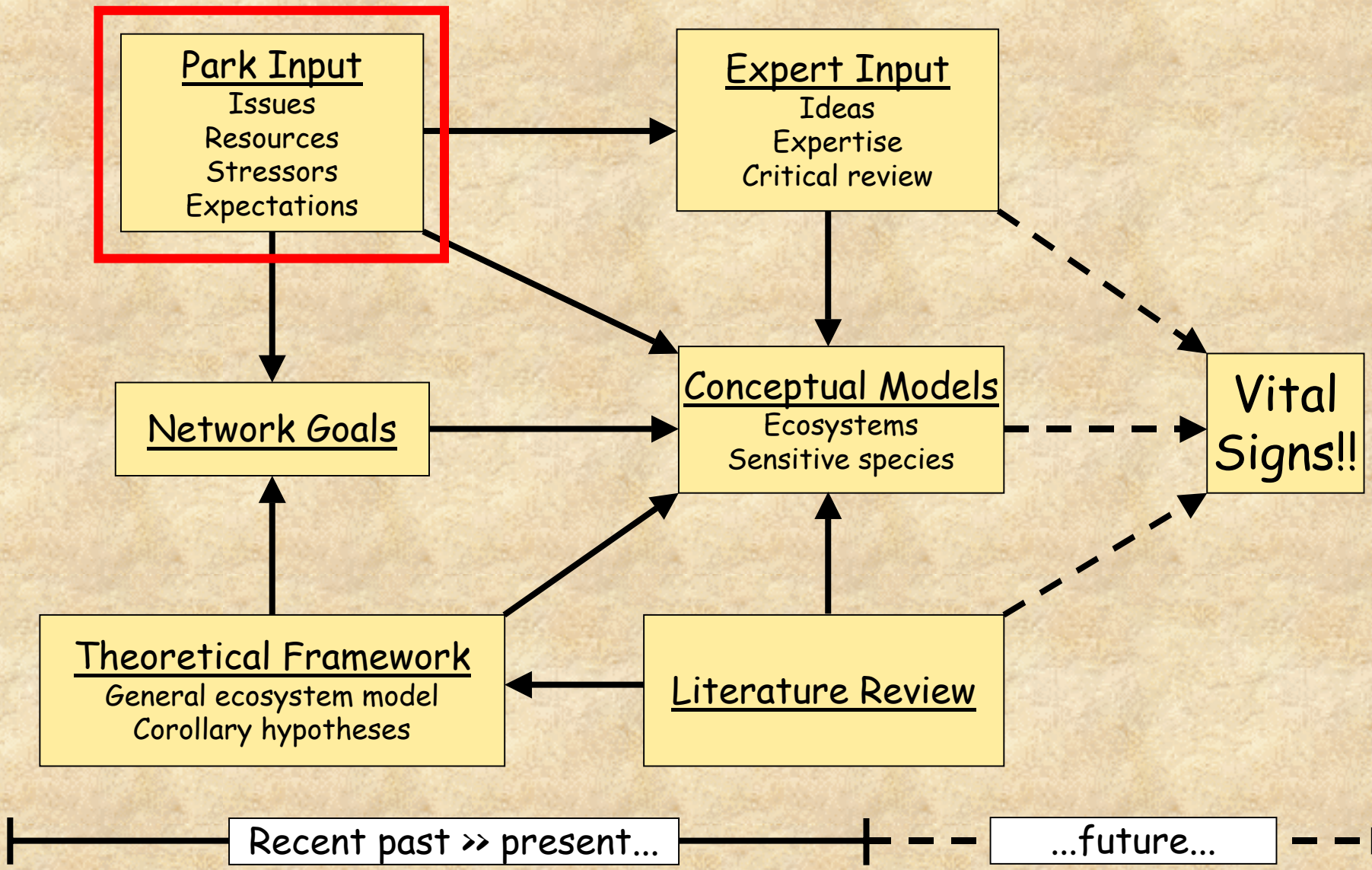
SUMMARIZE EXISTING DATA & UNDERSTANDING

- Information and Data Synthesis
  - Descriptions of Park Resources and Legislation
  - Park Management Issues Summary
  - Resource - Stressors of Concern Summary
  - Monitoring Narratives (by resource & park)
  - Current & past park monitoring datatables
  - Partner monitoring datatable
  - Literature Review
  - Conceptual Models

Information & Data Synthesis



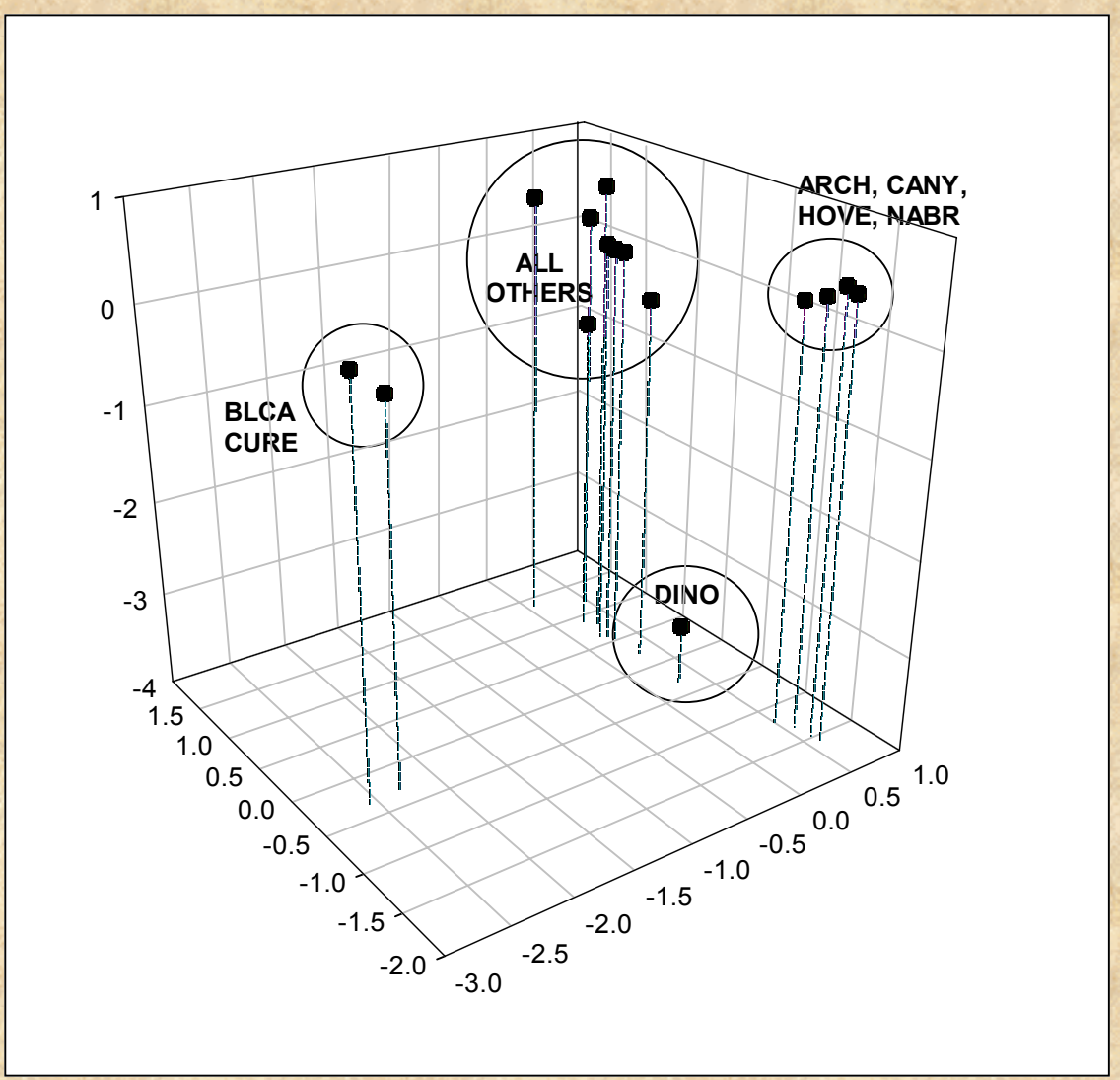
Our Quest for Vital Signs



Park Input: Monitoring-Needs Database

- Designed to capture and manage park input regarding monitoring issues and needs
- Each database record characterizes a unique stressor >> resource >> response pathway
  - 1293 records
  - 216 unique stressor-resource combinations
- Tremendous variability among parks
  - Level of effort
  - Characterization of stressor-resource relationships

Park Groupings in Relation to Monitoring-Needs Database



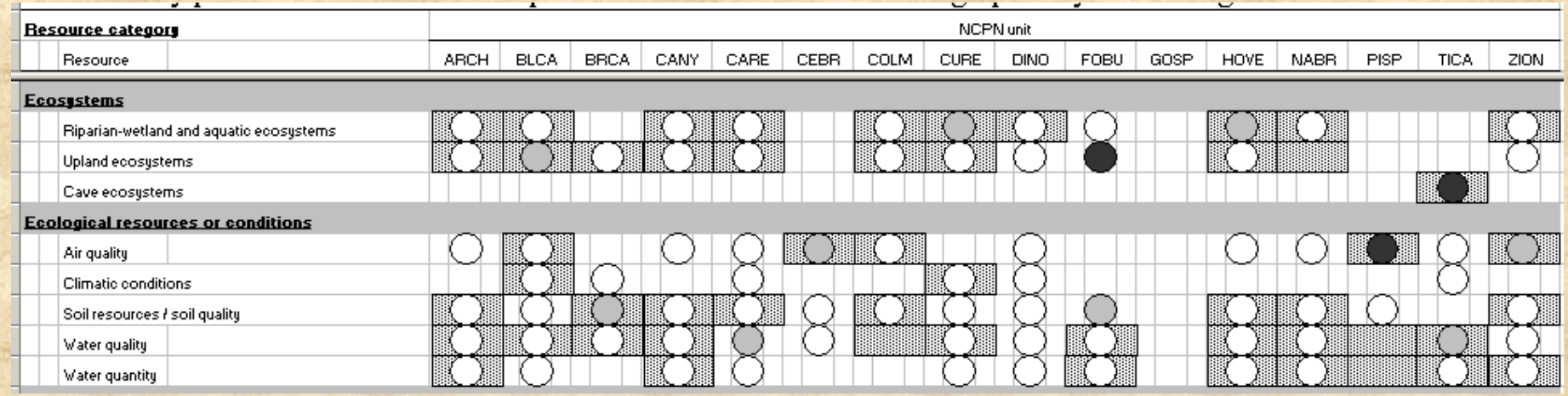
Groupings reflect:

- Similar stressor >> resource characterizations
- Level of effort
- Views of respondents

Subjective reality

Monitoring-Needs Database: Synthesis Tables

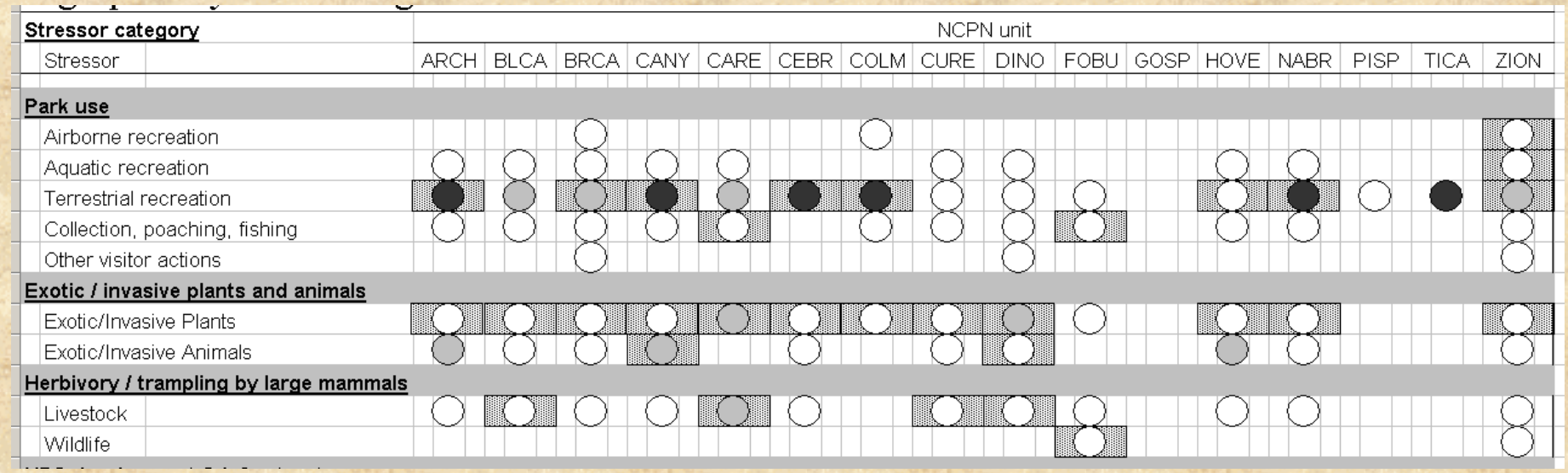
- Resources of concern



Resource category	NCPN unit															
Resource	ARCH	BLCA	BRCA	CANY	CARE	CEBR	COLM	CURE	DINO	FOBU	GOSP	HOVE	NABR	PISP	TICA	ZION
Ecosystems																
Riparian-wetland and aquatic ecosystems	○	○		○	○		○	◐	○	○		◐	○			○
Upland ecosystems	○	◐	○	○	○		○	○	○	●		○				○
Cave ecosystems															●	
Ecological resources or conditions																
Air quality	○	○		○	○	◐	○		○			○	○	●	○	◐
Climatic conditions		○	○		○			○	○						○	
Soil resources / soil quality	○	○	◐	○	○	○	○	○	○	◐		○	○	○		○
Water quality	○	○	○	○	◐	○		○	○	○		○	○		○	○
Water quantity	○	○		○	○			○	○	○		○	○		○	○

Monitoring-Needs Database: Synthesis Tables

- Stressors of concern

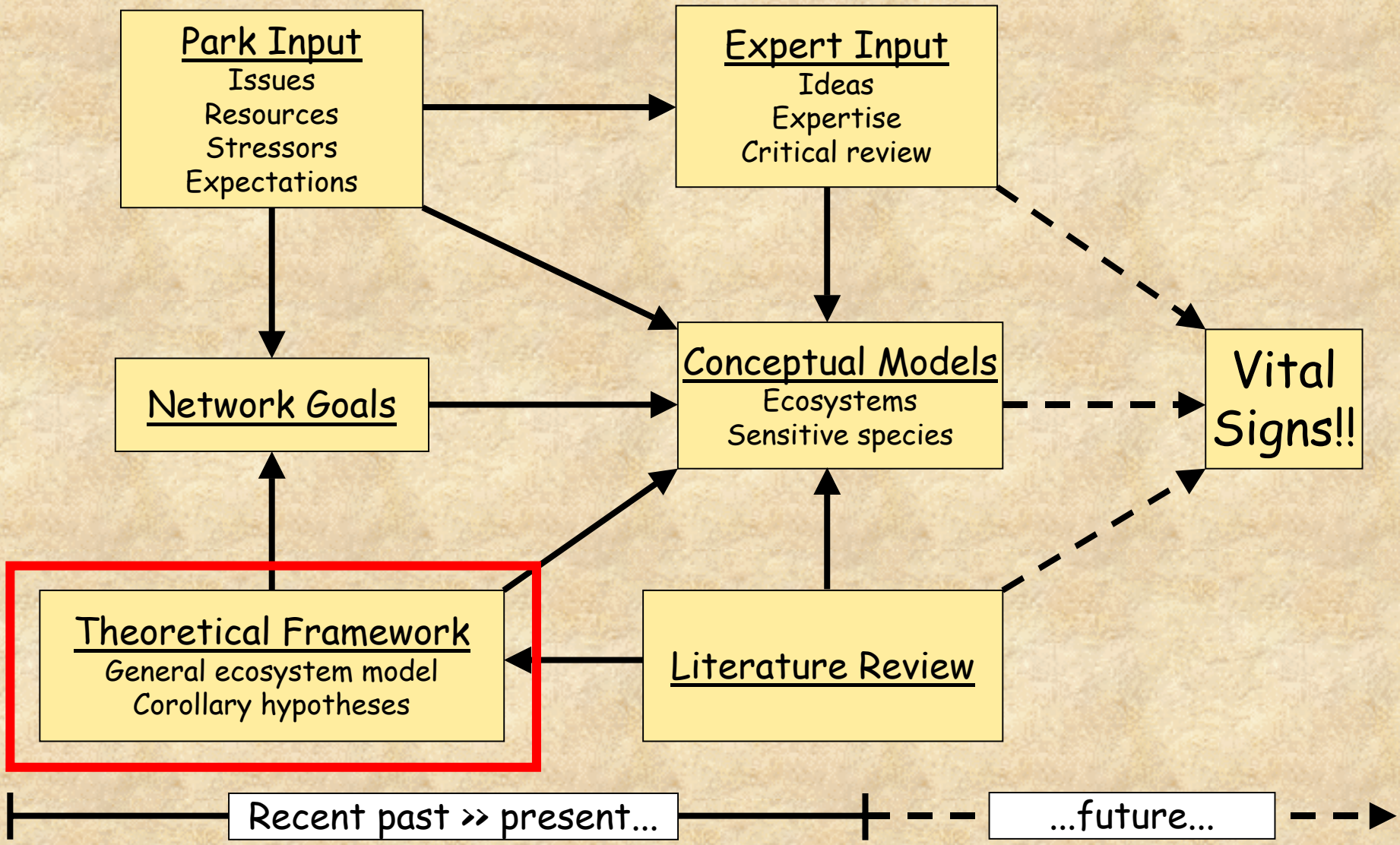


Stressor category	NCPN unit															
Stressor	ARCH	BLCA	BRCA	CANY	CARE	CEBR	COLM	CURE	DINO	FOBU	GOSP	HOVE	NABR	PISP	TICA	ZION
Park use																
Airborne recreation																
Aquatic recreation																
Terrestrial recreation																
Collection, poaching, fishing																
Other visitor actions																
Exotic / invasive plants and animals																
Exotic/Invasive Plants																
Exotic/Invasive Animals																
Herbivory / trampling by large mammals																
Livestock																
Wildlife																

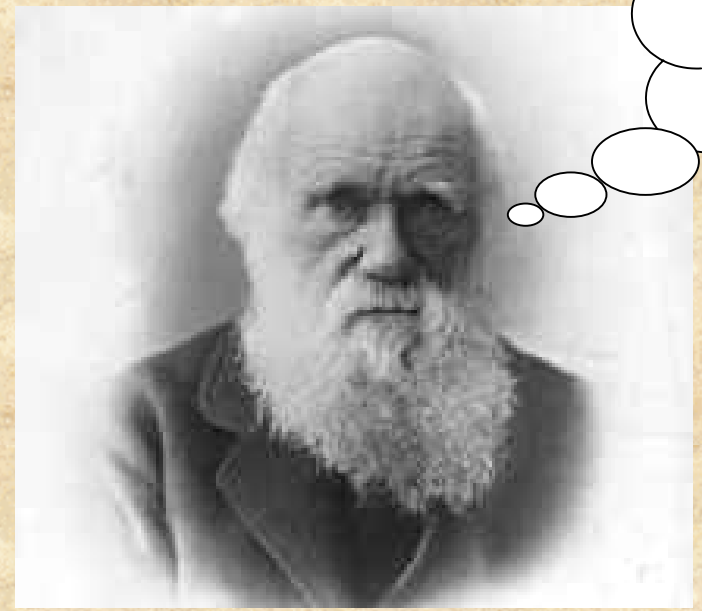
Monitoring-Needs Database: Synthesis Tables

- Stressors of concern

Our Quest for Vital Signs



Why Do We Need a Theoretical Framework??



Let theory guide your observations .

Monitoring:

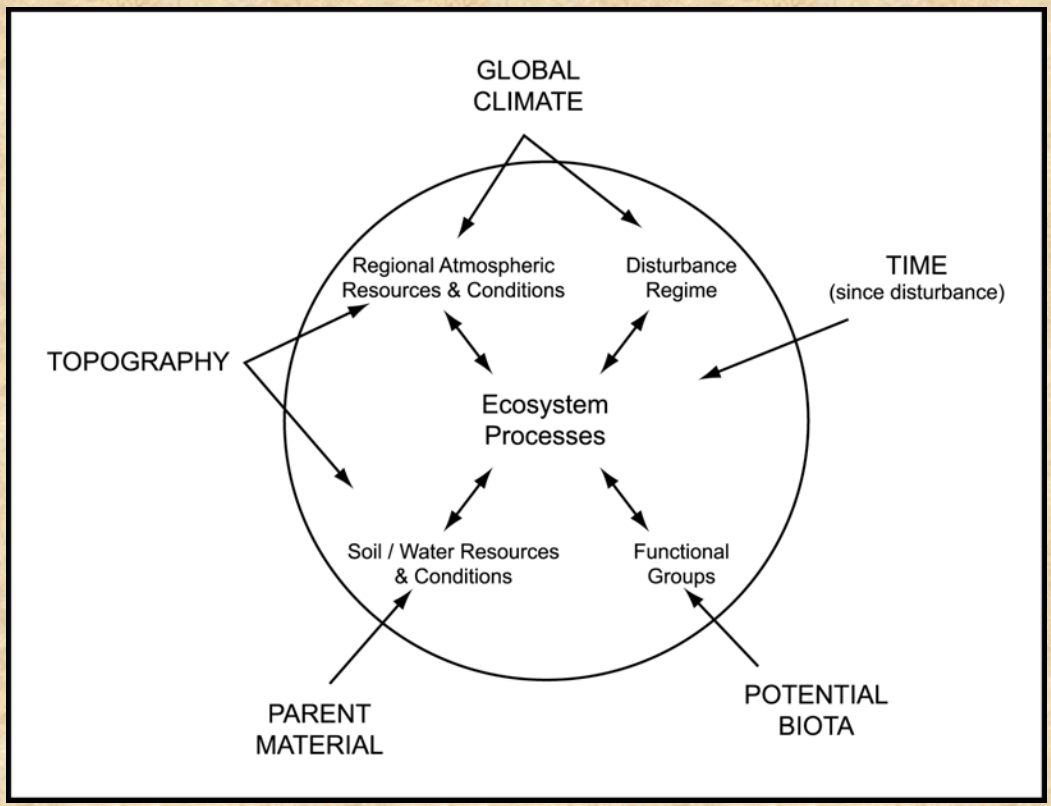
Purposeful repeated observations.

Roughgarden, J., R. M. May, and S. A. Levin. 1989. Introduction. Pages 3-10 in J. Roughgarden, R. M. May, and S. A. Levin, eds. *Perspectives in ecological theory*. Princeton University Press, Princeton.

Theoretical Framework:

1. General model

- Factors governing ecosystem structure & function
- Controls of ecosystem sustainability
- Changes that can lead to alternative ecosystem 'states'

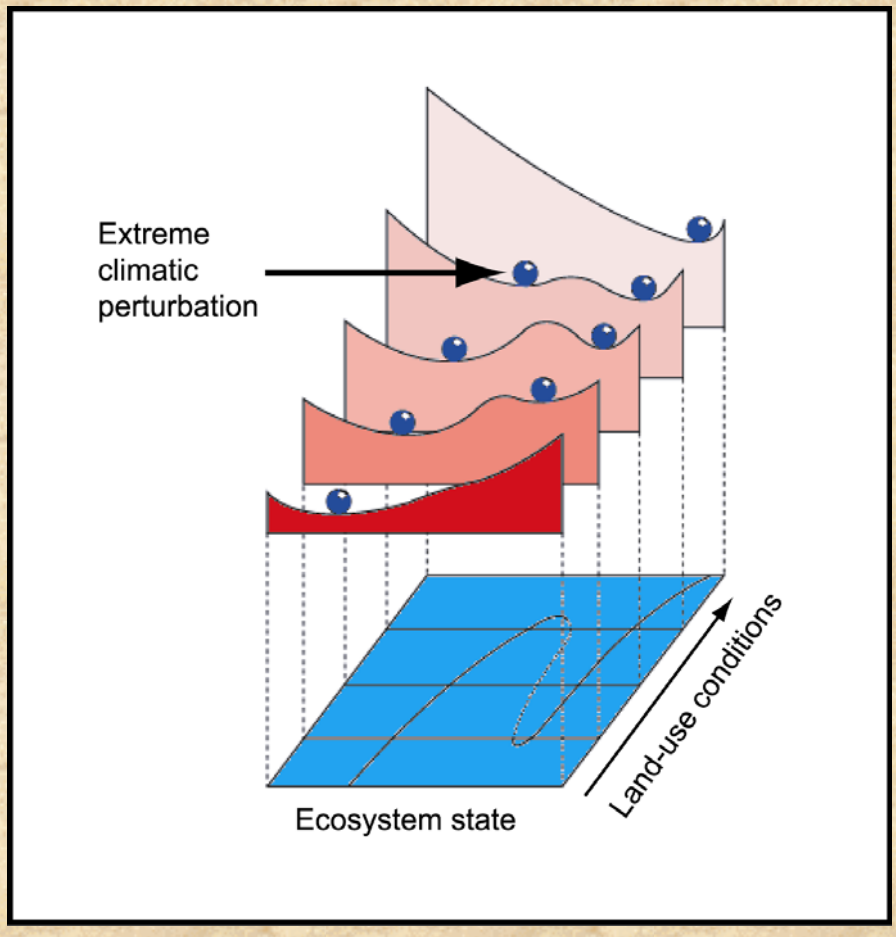


Modified from Chapin, F. S., III, M. S. Torn, and M. Tateno. 1996. Principles of ecosystem sustainability. *The American Naturalist* 148: 1016-1037.

Theoretical Framework:

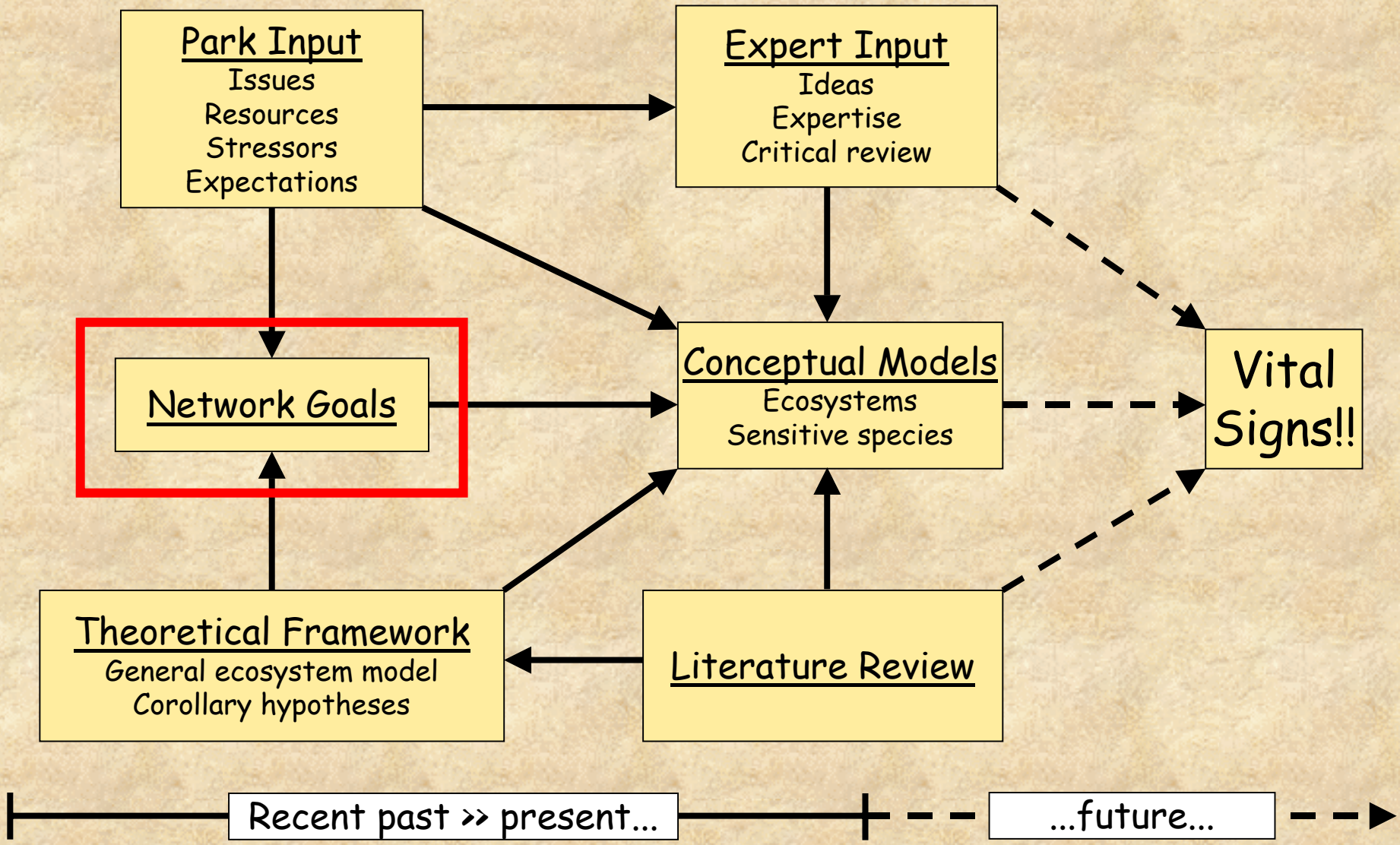
2. Corollary hypotheses

- Episodic events can cause ecosystems to cross thresholds between alternative states *abruptly*
- The probability of sudden state shifts is affected by gradual declines in system *resilience*



Modifed from Scheffer, M., S. Carpenter, J. A. Foley, C. Folke, and B. Walker. 2001. Catastrophic shifts in ecosystems. *Nature* 413: 591-596.

Our Quest for Vital Signs



Network Goals for VS Monitoring

Categories

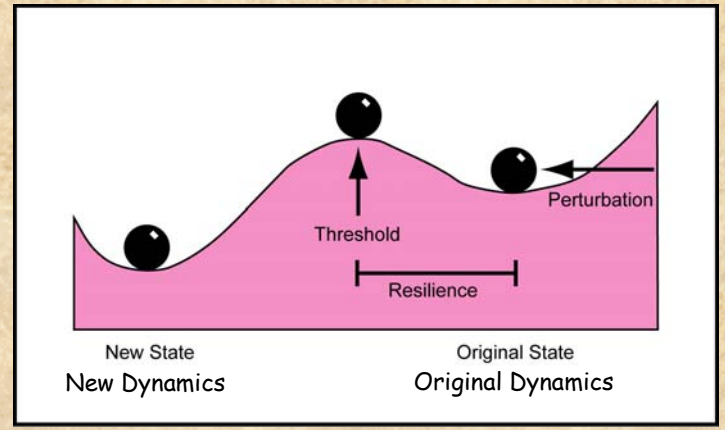
- Ecosystem sustainability
- Impairment
- Key resources
- Partnerships
- Technical support

Network Goals for VS Monitoring

Ecosystem Sustainability

1. Determine status and trends in selected indicators of ecosystem resistance and resilience to disturbance to *avoid crossing thresholds of undesirable ecosystem change*.

2. Provide technical expertise and data to determine or *evaluate carrying capacities compatible with sustaining resilient park ecosystems*.



Network Goals for VS Monitoring

Impairment

3. Provide technical expertise and data to *support management determinations of impairment of park ecosystems*, including key components and processes that interactively control ecosystem structure and function.

Park Protection National Park Service US Department of the Interior

Section 1.4 of the 2001 Edition of *National Park Service Management Policies*, Interpreting the Key Statutory Provisions of the 1916 NPS Organic Act.

1.4 Park Management

1.4.1 The Laws Generally Governing Park Management
The most important statutory directive for the National Park Service is provided by interrelated provisions of the NPS Organic Act of 1916, and the NPS General Authorities Act of 1970, including amendments to the latter law enacted in 1978.

The key management-related provision of the Organic Act is:

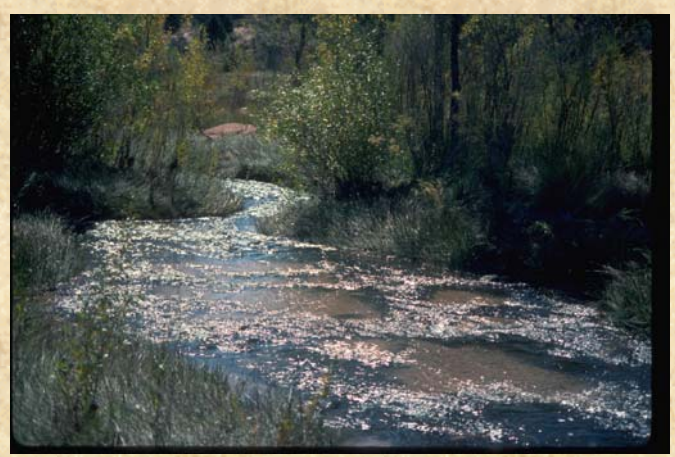
> [The National Park Service] shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations hereinafter specified . . . by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations. (16 USC 1)

Network Goals for VS Monitoring

Key Resources of the Colorado Plateau Ecoregion

4. Provide technical expertise and data to support management and protection of *riparian-wetland and aquatic ecosystems* that are major contributors to the diversity and ecological integrity of network parks.

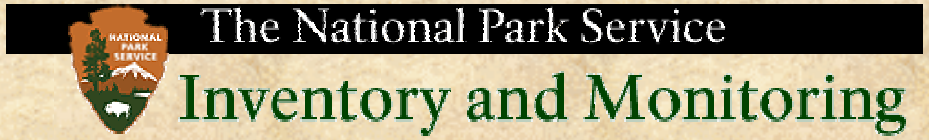
5. Provide technical expertise and data to support management and protection of *endemic organisms* unique to the Colorado Plateau ecoregion.

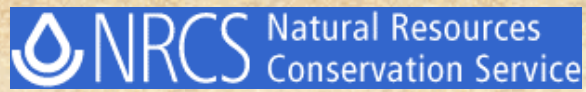


Network Goals for VS Monitoring

Partnerships

6. *Work with partners to promote effective stewardship* of natural resources that transcend management boundaries.





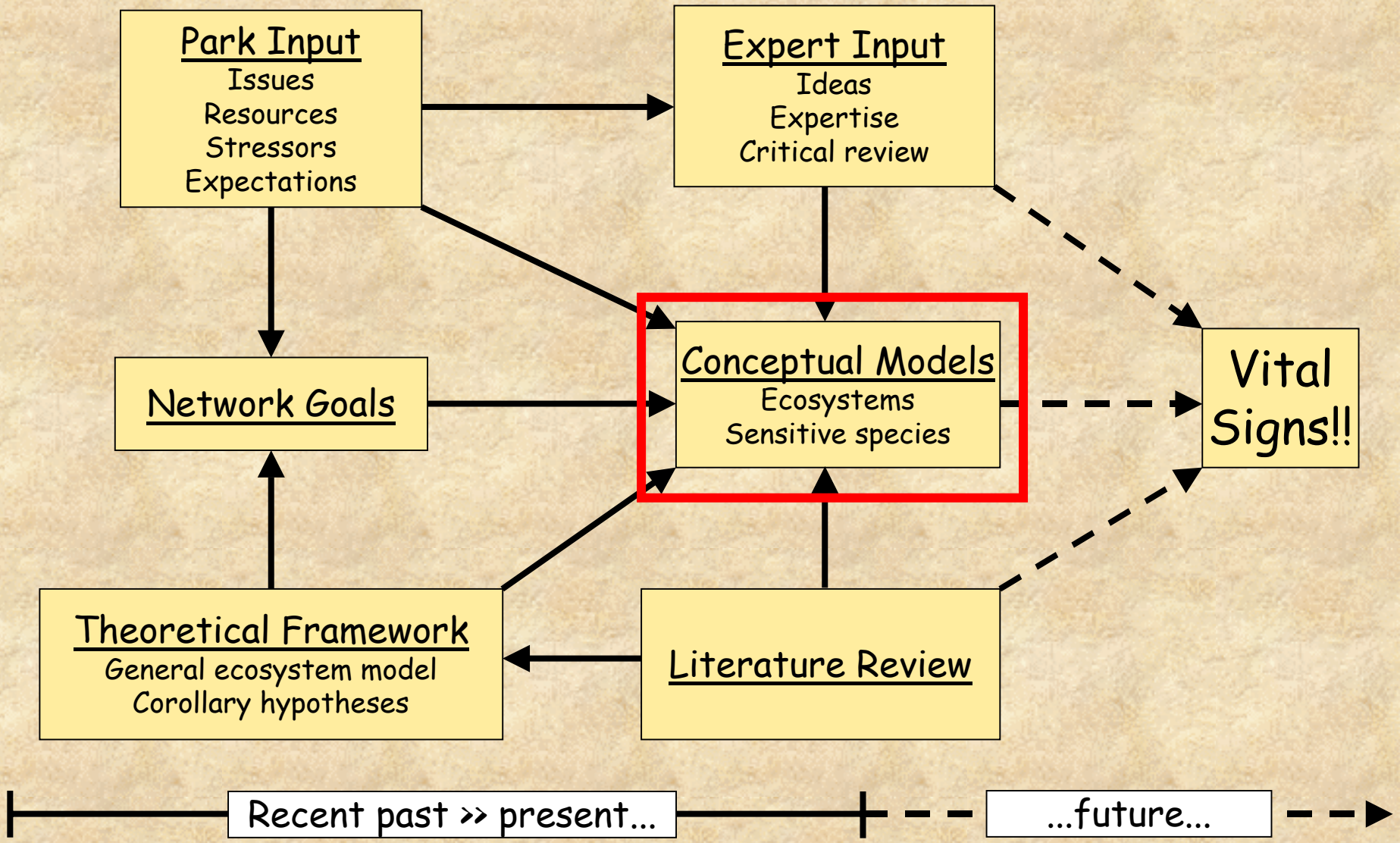
Network Goals for VS Monitoring

Technical support

7. Provide technical expertise to *support and supplement park staff* in the management of natural resources.

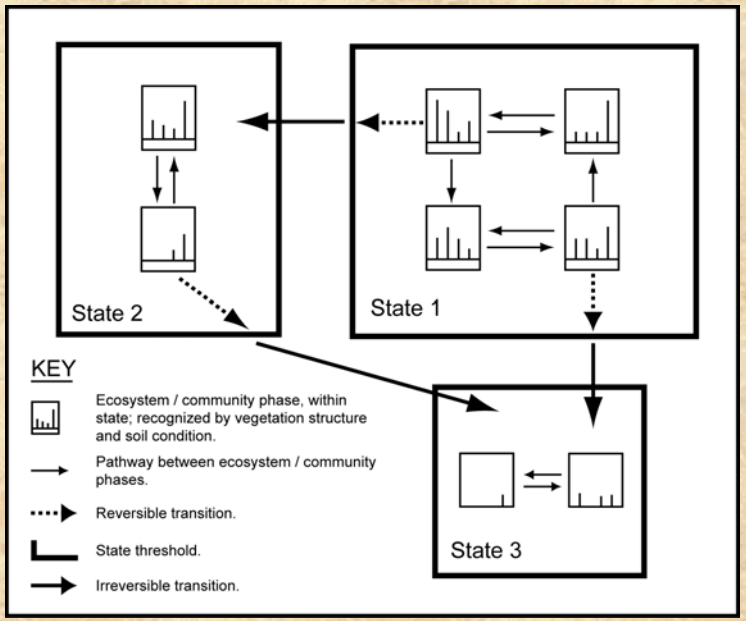
8. Provide technical expertise and assistance to *sustain the long-term management of, and access to, natural resouce-related data* collected on or by parks.

Our Quest for Vital Signs



Conceptual Modeling

Approach: State-and-Transition Models

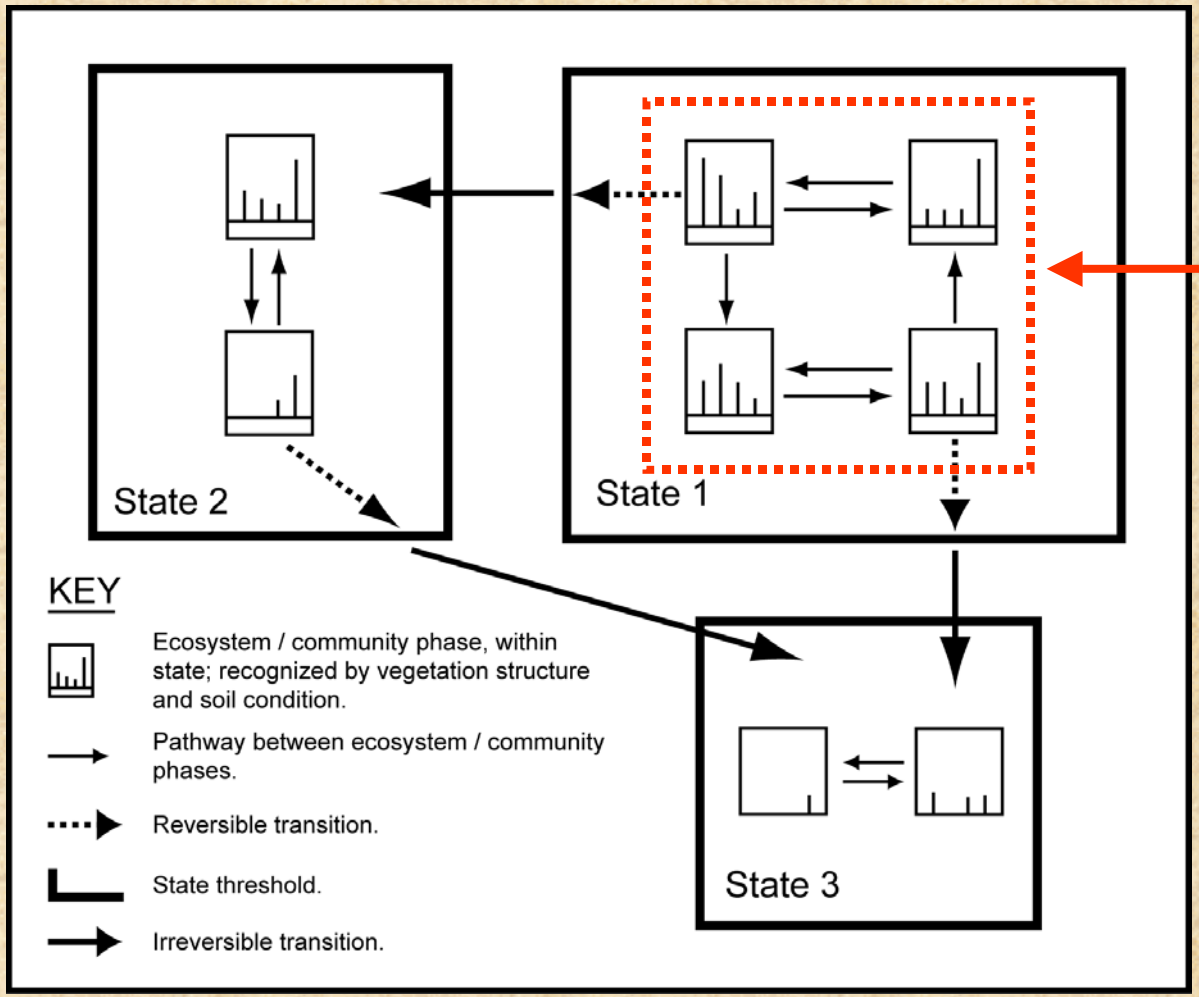


Management-oriented tool for:

- Organizing thoughts and information
- Considering and describing thresholds and transitions among ecosystem states -- desired and undesired
- Posing hypotheses

Accompanied by mechanistic models that describe effects of stressors on key ecosystem components and processes, and how these effects may influence the probability of state shifts.

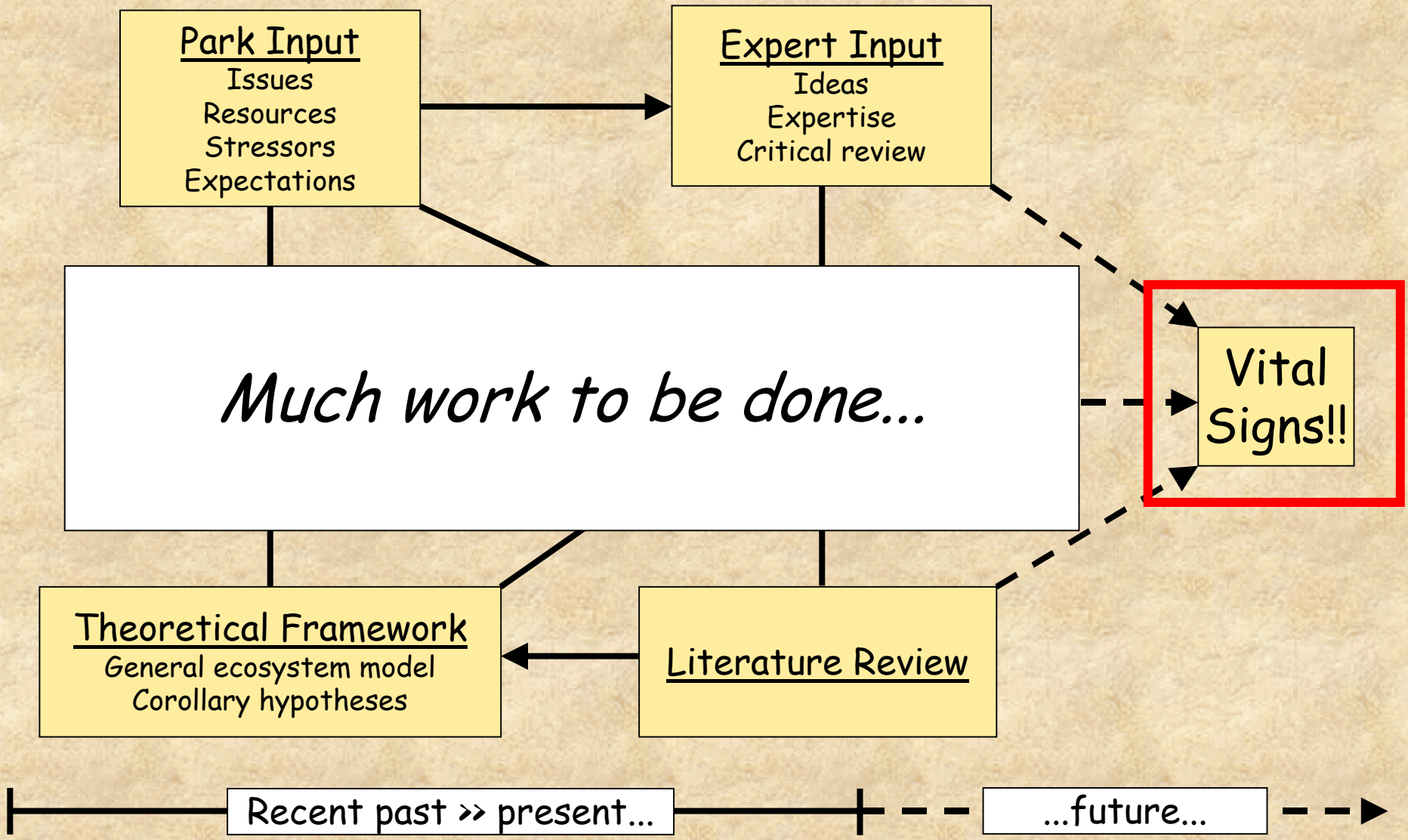
State-and-Transition Models



Management trigger initiated by monitoring program to avoid crossing undesirable ecological threshold.

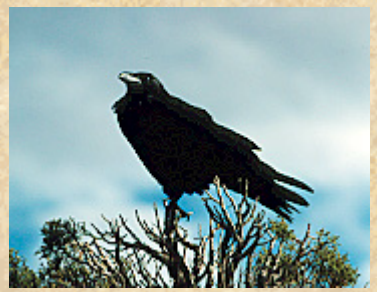
Adapted from Stringham, T. K., W. C. Krueger, and P. L. Shaver. 2001. States, transitions, and thresholds: Further refinement for rangeland applications. Pages 15. Agricultural Experiment Station, Oregon State University, Corvallis, OR.

Our Quest for Vital Signs



LOOKING BACK: Lessons Learned

- Hire Staff Immediately - Especially a data manager
  "Steal good people from other agencies"



- Data Mining and Management is a bigger task than originally envisioned
- Service-wide I&M Databases in Beta Versions have extended timeline for meeting network data management goals
- Current Program Deadlines are Challenging to Meet
- Parks need to be Prepared for Commitment & Workload
- Remote Location & Distance from Universities a Challenge

LOOKING BACK: Network - Park Relations

- Establish and maintain good communication with park staff
- Network staff accomplish as much work as possible, to minimize requests of park staff
- Cost-share temporary positions with parks to cultivate closer working relationships between network and parks
- Develop projects with immediate tangible benefits to parks--these result in park *buy-in* to program (e.g. vegetation mapping, invasives)
- BOD and TC has given NCPN staff much latitude
- Parks in the network have congenial working relationship

LOOKING BACK: Noteworthy Successes

- Network approach to research permitting and compliance work for I&M studies.
- Successful leveraging of funds to develop a program that is both *innovative and integrative*.